derground cables, and the attendant puncturing thereof, will also be the theme of a paper. Electric-light stations as fire risks will be treated by an expert in fire underwriting, who has given especial time and attention to that branch of the subject. Municipal lighting will be the subject of one or two papers, and no doubt of a profitable discussion. The committee on underground conduits and conductors has carried on a correspondence with the electric-lighting fraternity, and it seems proper that the information gathered should be presented in Chicago, where the undergrounding of electric-lighting wires has been more practically carried out than perhaps in any other city in the world. This question, which is at present one in which diverse opinions are held by men of equal professional standing, is one which this association cannot afford at the present time to ignore or overlook."

After some routine business, came the report of the committee on patent legislation, which shows that much progress has been made in the direction of securing the establishment of a court of patent appeals. This court is to consist of three justices, appointed by the President, with the advice and consent of the Senate, to have appellate jurisdiction in cases touching patents, copyrights, trademarks, and labels. "The expediency and propriety of, if not the necessity for, the establishment of such a court as contemplated by this measure," to use the language of the committee's report, "will not be questioned if proper consideration be given to the objects that will be attained by the passage of this bill."

It is claimed that such a court would enable the public and patentees to determine the value and validity of patents without serious and vexatious delays; that it would relieve the Supreme Court of much of the burden imposed upon it by this class of litigation; that practice in the patent office would become thoroughly fixed and understood, and the issue of worthless patents would be greatly diminished, if not entirely suppressed; and that it would tend to simplify the patent laws by construction, and settle questions of doubt which are often used by litigants for the purpose of injustice and oppression. Under the present condition of the business of the courts, it requires ordinarily from two to three years to obtain a decision in the circuit courts of the United States, and, if appealed to the Supreme Court, from three to four years are required to obtain a decision. The same difficulty and delay attend the determination of all other questions involving the determination of property rights. While this is true, it should be borne in mind that this species or character of property differs from all other kinds of property. The duration of the owner's title is arbitrarily fixed by law. The period is short, for the most part seventeen years. The Constitution imposes upon Congress the duty of securing to authors and inventors, for a limited time, the exclusive right to their respective writings and inventions. This duty is very imperfectly discharged, when, by the omission of Congress to provide proper means to determine questions arising out of patents, the life of a patent may be frittered away by the delays of the law.

The committee on insulation of wires and installation of plants being called upon for a report, it was shown that the duties of that committee were of such a character that no one engaged in the electric-lighting business would care to attempt to fulfil them: consequently there was no report to make, and the committee was accordingly discharged; as was also the committee on electrical education, which reported that Columbia College of New York had so effectively taken up the work of the committee as to render its further services unnecessary.

At the opening of the session of Wednesday, after the usual preliminary business was disposed of, the report of the underground committee was read. It contained a large number of answers to a circular issued by the committee relative to the operation of underground wires. The report was discussed by Professor Barrett, who said the underground problem was solved successfully in Chicago. Mr. W. H. Johnstone discussed the paper at length, and gave the results of experience with his own conduit, which has been laid in Philadelphia and New York. Mr. T. Carpenter Smith said that overhead wires, when well constructed, were the safest method of distribution. Mr. De Camp spoke of the non-success of running arc-light wires under ground in Philadelphia, and was joined therein by Mr. Charles Cooper and others. Mr. B. E Sunny said that technically his underground arc wires were successful, but their cost was very high, the expense of maintenance amounting to one cent per lamp per hour during an experience of ninety days.

The discussion induced by this report was exceedingly interesting, and made prominent the fact that many difficult problems relating to the transmission under ground of high-tension electric currents yet remain to be solved.

On Thursday, the last day of the convention, a resolution was adopted to the effect that the report of the committee on underground wires be recommitted, and three new members were added to the committee. This committee, the result of whose labors during the next half-year will be awaited with great interest, now consists of Messrs. Lynch, Barney, Kerr, Davis, Crocker, Sperry, Barrett, and Sunny.

A resolution was unanimously adopted by the association to the effect that the members of that body would decline to allow any electric current under their control to be used for the purpose of inflicting the death-penalty upon condemned criminals.

In the afternoon session the committee on insurance exchange made a report, describing the work accomplished by the New England Electric Exchange in the licensing of persons installing and operating electric-light plants, and recommending the organization of similar exchanges in every State.

Niagara Falls was selected as the next meeting-place of the association, the date to be determined by the executive committee; and the following officers were elected for the ensuing year: president, E. R. Weeks of Kansas City; first vice-president, A. J. De Camp of Philadelphia; second vice-president, E. A. Maher of Albany, N.Y.; executive committee, B. Rhodes of Niagara Falls, B. E. Sunny of Chicago, C. R. Huntley of Buffalo, Dr. O. A. Moses of New York, E. T. Lynch, jun., of Brooklyn, P. H. Alexander of New York, J. F. Morrison of Baltimore, and T. Carpenter Smith of Philadelphia.

Among the papers read at the convention were one by Mr. S. E. Barton, on "Electric Light Stations as Fire Risks," which was discussed by Messrs. Morrison, Alexander, and others; one by Mr. C. H. Rudd, entitled "Disruptive Discharges in Lead Cables," discussed by Messrs. Barrett, Lockwood, and Acheson; one by Mr. S. S. Leonard, on "Petroleum Fuel;" one by M. J. Francisco, on "Liquid Fuel;" and one treating of the "Advantages of Oil for Fuel," by Col. C. M. Ransom. The discussion of these latter papers was participated in by Messrs. Leonard, Lockwood, Ransom, and Francisco. Papers were also read by Mr. F. H. Whipple, on "Municipal Lighting," and by Mr. A. R. Foote, on "Public Ownership of Commercial Monopolies."

The interesting report of the committee on underground conduits and conductors excited a somewhat lively discussion, which was ably carried on by many of the members present. The further report of this committee at the next convention will be awaited with much interest, as the subject of putting electric-light wires under ground in our large cities has assumed great importance.

A party of sixty gentlemen, mostly electricians, visited the convention by special train from this city. The train consisted of three Pullman vestibule cars, a dining-car, and a combination car with bath-room and barber-shop. It was lighted throughout by electricity furnished by an Eickemeyer dynamo driven by a Brotherhood engine.

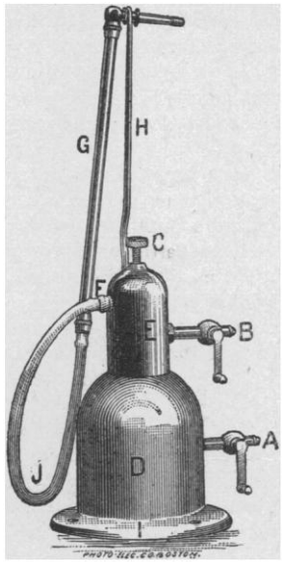
On the afternoon of Wednesday, after adjournment, a party of delegates and visitors to the convention paid a visit, by invitation, to inspect an installation of accumulators recently placed in the residence of Potter Palmer by the Electric Accumulator Company. The current is generated by one of the United States Company's dynamos driven by an Otto gas-engine. The plant works admirably, giving great satisfaction to Mr. Palmer as well as to the company which supplied it.

HARWOOD'S NITROUS-OXIDE BLOW-PIPE.

A SIMPLE and convenient form of compound blow-pipe, invented by Dr. G. F. Harwood of Worcester, Mass., is shown in the accompanying engraving. It is intended for use in scientific laboratories, technical schools, dental offices, and other places where a powerful and concentrated flame under perfect control is required.

The apparatus is so designed and constructed that it will take the necessary supply of nitrous oxide from the ordinary gasometer at low pressure, or from a gas cylinder at high pressure, and economically combine it with ordinary illuminating-gas in any desired proportion for producing and maintaining a flame of the requisite intensity.

In construction, the apparatus is simple and easily understood. It consists of an expansion-chamber or reservoir, *D*, provided with a lever stop-cock *A*, which is to be connected wtth the nitrous-oxide supply at the gasometer or cylinder by strong rubber tubing.



HARWOOD'S NITROUS-OXIDE BLOW-PIPE.

Above this reservoir is the mixing-chamber, *E*, with a lever stop-cock, *B*, to be connected by rubber tubing with the illuminating-gas supply. The expansion-chamber or reservoir is separated from the mixing-chamber by a diaphragm, which is provided with a regulating-valve, the stem of which projects upward through the mixing-chamber. By means of the small hand-wheel, *C*, on this stem, the admixture of the two gases may be perfectly controlled. The combined gases are conducted through the outlet *F*, and flexible tubing *J*, to the blow-pipe tube *G*. This tube is provided with interchangeable nozzles, by means of which either a large or a small flame may be secured. When not in use, the nozzle is supported by the curved wire standard *H*. The flange *I* is drilled for screws, by which the apparatus may be secured in any convenient position to the wall or to a shelf or bench.

BELLITE.

ON Tuesday, Feb. 5, a series of experiments were made at Chadwell Heath, England, with the new explosive, bellite, invented by Mr. Carl Lamb. A description of these experiments is given in *Engineering* of Feb. 8, 1889. Reference is also made to this explosive in the same journal for July 1, 1887, and in that for Nov. 9, 1888. The new series of experiments were fully as successful as those described in these articles, and the absolute safety of the new explosive has now been placed beyond cavil. The experiments were arranged in groups, each of which was intended to illustrate either a distinguishing characteristic of bellite or its adaptability to some specified end. The first experiment was intended to exemplify its use in submarine mining: 1½ pounds of the material was enclosed in a tin canister, and, on being fired by a detonator, the explosion sent the spray fully 150 feet high. The next group of experiments were made with the object of showing the perfect safety of the material, and that it could only be fired by a detonator. A bellite cartridge was broken in two, and one half thrown on a fire, where it slowly burnt away with a reddish flame: the other half, weighing about 2 ounces, was then exploded on a wrought-iron plate 12 inches by 12 inches by ⅜ of an inch thick, the charge being tamped with clay. The shock bulged the plate to a depth of about 2 inches, but did not pierce it. An even more convincing proof of its safety was afforded by the chairman of the company, who, holding part of a naked bellite cartridge in one hand, calmly applied a lighted fusee to the fragment with the other. The bellite charred and smouldered, but went out immediately on removing the match. The next experiment was a repetition, on a somewhat smaller scale, of one of the Middlesbrough experiments, described in the second of the articles quoted above. An iron weight, weighing 120 pounds, was dropped from a height of 18 feet on to a number of naked bellite cartridges supported on an iron plate. The test was repeated twice, as on the first occasion the weight fell somewhat to one side; but on the second trial, with more careful centring, the mass of bellite was crushed to a powder. This test was much less severe than the Middlesbrough one, when the weight was half a ton, and fell from a height of 20 feet; but a heavy weight of this character is not easily moved from place to place, and hence the reason for the lighter one. A small canister capable of holding 5 ounces was then filled with the fragments resulting from the last experiment, and laid on the web of an old Great Eastern Railway Company's steel-faced rail, the charge being slightly tamped with clay. On firing, the rail was snapped in two, a piece about 1 foot long being flung 6 yards, and smaller fragments much farther, while a pit 15 inches deep was sunk in the ground immediately underneath the position of the charge.

The next experiment was a repetition of one first made at one of the collieries of South Wales. In it 1 pound of ordinary blasting-powder and 1 pound of naked bellite cartridges were placed together in an open pit 1 foot 10 inches deep, and the powder ignited. Some pieces of the bellite were thrown out of the hole, and all were slightly charred, but none of it exploded.

To further illustrate the safety of the material, a fragment of bellite was fired from a large-caliber gun (No. 8) with two drams of powder, against an iron plate, without any explosion of the bellite occurring either in the bore of the gun or on striking the target. This experiment would, moreover, seem to prove that bellite is well adapted for use in shells, and the English Government is accordingly to be congratulated on not having spent large sums in acquiring the secret of melinite. It had been the intention of the experimenters to fire a bullet from the same gun at a target formed of bellite cartridges backed by an iron plate; but, owing to the jamming of a cartridge in the gun, this experiment had to be abandoned.

To compare the effects of bellite with those of dynamite, 2 ounces of each explosive were fired on wrought-iron plates measuring 12 inches by 12 inches by ⅜ of an inch thick; each plate, with the object of rendering the conditions as uniform as possible, being supported above the ground by a narrow cast-iron ring about $\frac{5}{16}$ of an inch thick, 3 inches high, and 11 inches internal diameter, the charge in each case being tamped with clay. Both plates were pierced through, but the rents in the one on which the dynamite had been fired were considerably larger, while, on the other hand, the bulge in this plate was only 2½ inches deep, as compared with 3 inches in the case of the other, thus showing the action of the dynamite to be more local.

The next series of experiments were made with a view to showing the adaptability of bellite to military purposes. To this end the ballistic properties of bellite and Curtis and Harvey's rifle-powder were first compared; a 6-inch ball, weighing 32 pounds, being fired from a mortar, first with ½ ounce of powder, and, second, with ¼ ounce of bellite, the weighings being carefully made in the presence of two representatives of the press. With the powder, the ball was thrown a distance of 40 yards 1 foot; and with the bellite, to a distance of upwards of 100 yards, the penetration into the ground being also much greater in this case.

Two mines had been prepared, one with 6 pounds of powder laid at a depth of 5 feet, and the other with 6 pounds of bellite laid at the same depth. In trying to explode these, however, it was found that in the passage of some of the spectators over the mine both fuzes had been pulled out from the bellite charge, and the attempt to fire it accordingly failed. A good idea of what the effects would have been was, however, gained in the next experiment, in which a mine containing 8 pounds of bellite was fired underneath a length of railway laid down for the purpose. The explosion smashed both